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(54) Low cost teleprocessing system

(57) A data processing system for collecting billing data from distributed sources, comprises a plurality of remote customer service sites 1a - c, each remote site including a memory 3a for storing billing data associated with customer services provided thereby; a central batch processing center 13 for creating customer invoices from the billing data associated with all the sites; and a teleprocessing center 5 connected to each of the remote sites and the batch processing center by telecommunications links. The teleprocessing center comprises a computer 8 for polling each of the remote sites through a communications interface to retrieve selected billing data; a first memory 11 for storing for each remote site an index representing the most recent billing record retrieved from that site; and a second memory 10 for simultaneously storing the billing data retrieved from the plurality of remote sites. The computer 8 is programmed to retrieve periodically from the remote sites the most recent billing data as determined by the stored indices, update the stored indices to reflect the most recent retrieved data for each site, and make the data from the second memory 10 available on demand to the batch processing center 13 for processing into customer accounts.

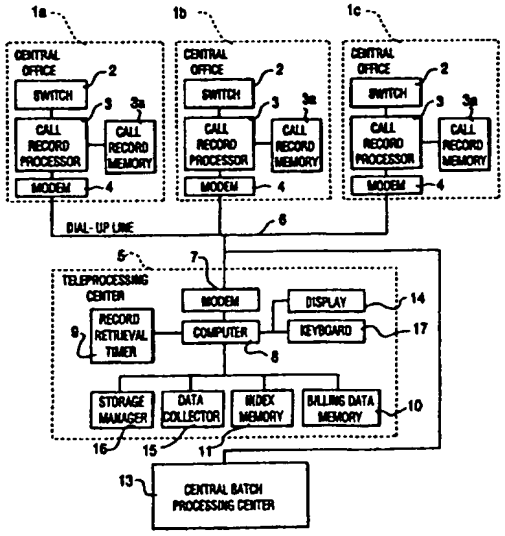

FIG.1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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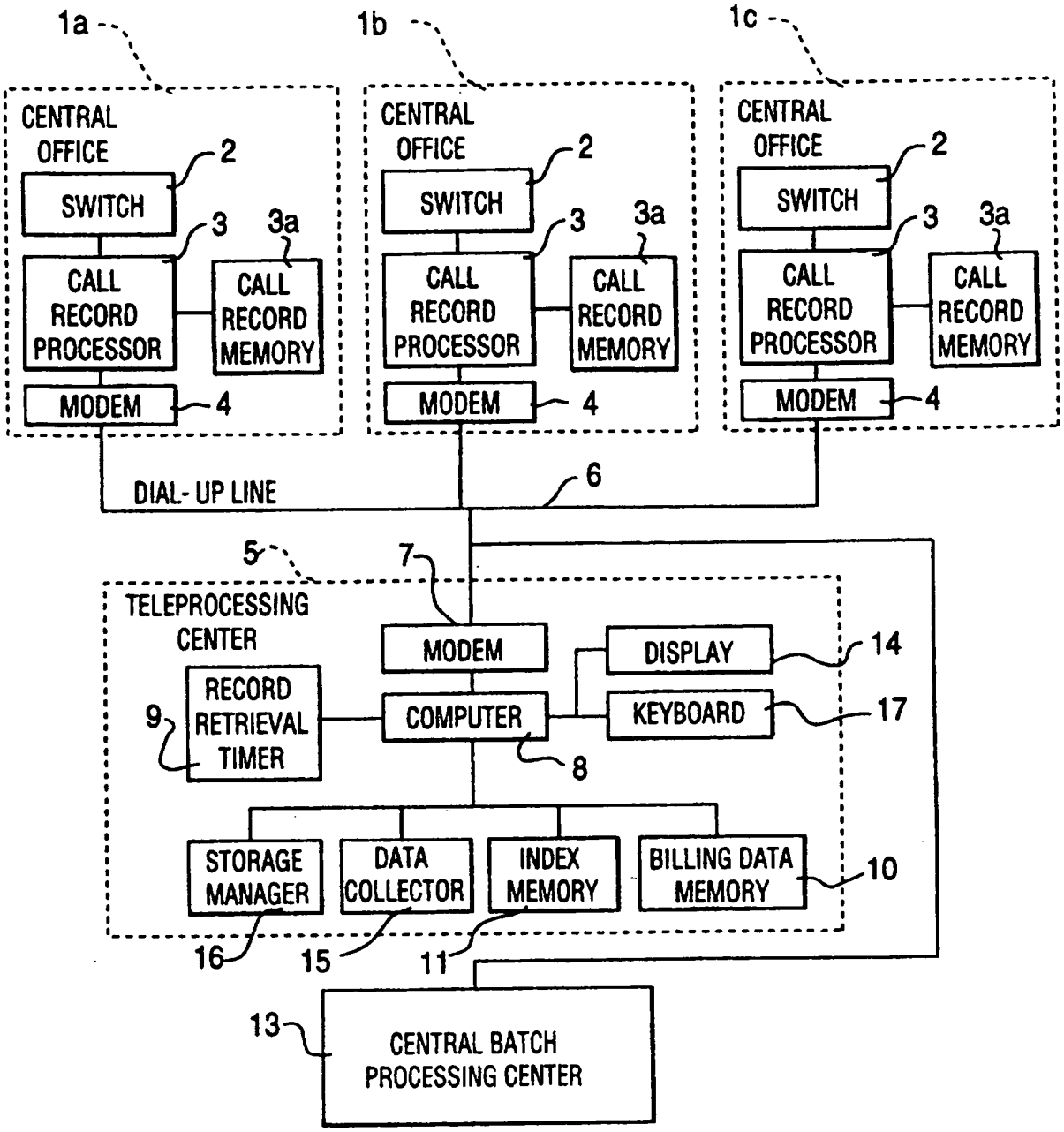
1a
1b
1c
CENTRAL OFFICE
SWITCH
2
3
3a
CALL RECORD PROCESSOR
CALL RECORD MEMORY
MODEM
4
DIAL-UP LINE
6
5
7
TELEPROCESSING CENTER
MODEM
DISPLAY
14
9
RECORD RETRIEVAL TIMER
COMPUTER
KEYBOARD
17
8
STORAGE MANAGER
DATA COLLECTOR
INDEX MEMORY
BILLING DATA MEMORY
10
16
15
11
13
CENTRAL BATCH PROCESSING CENTER

FIG.1

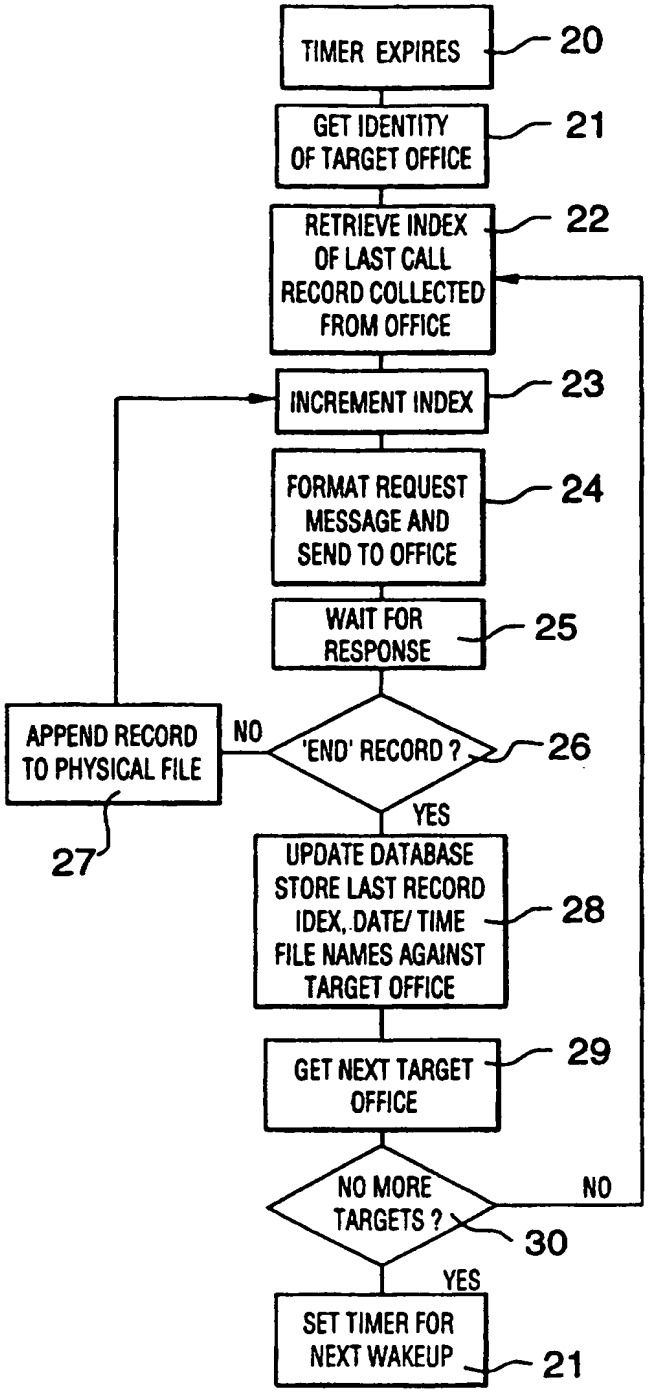
TIMER EXPIRES
20
GET IDENTITY OF TARGET OFFICE
21
RETRIEVE INDEX OF LAST CALL RECORD COLLECTED FROM OFFICE
22
INCREMENT INDEX
23
FORMAT REQUEST MESSAGE AND SEND TO OFFICE
24
WAIT FOR RESPONSE
25
'END' RECORD ?
26
NO
APPEND RECORD TO PHYSICAL FILE
27
YES
UPDATE DATABASE STORE LAST RECORD IDEX, DATE/ TIME FILE NAMES AGAINST TARGET OFFICE
28
GET NEXT TARGET OFFICE
29
NO MORE TARGETS ?
30
NO
YES
SET TIMER FOR NEXT WAKEUP
21

FIG.2

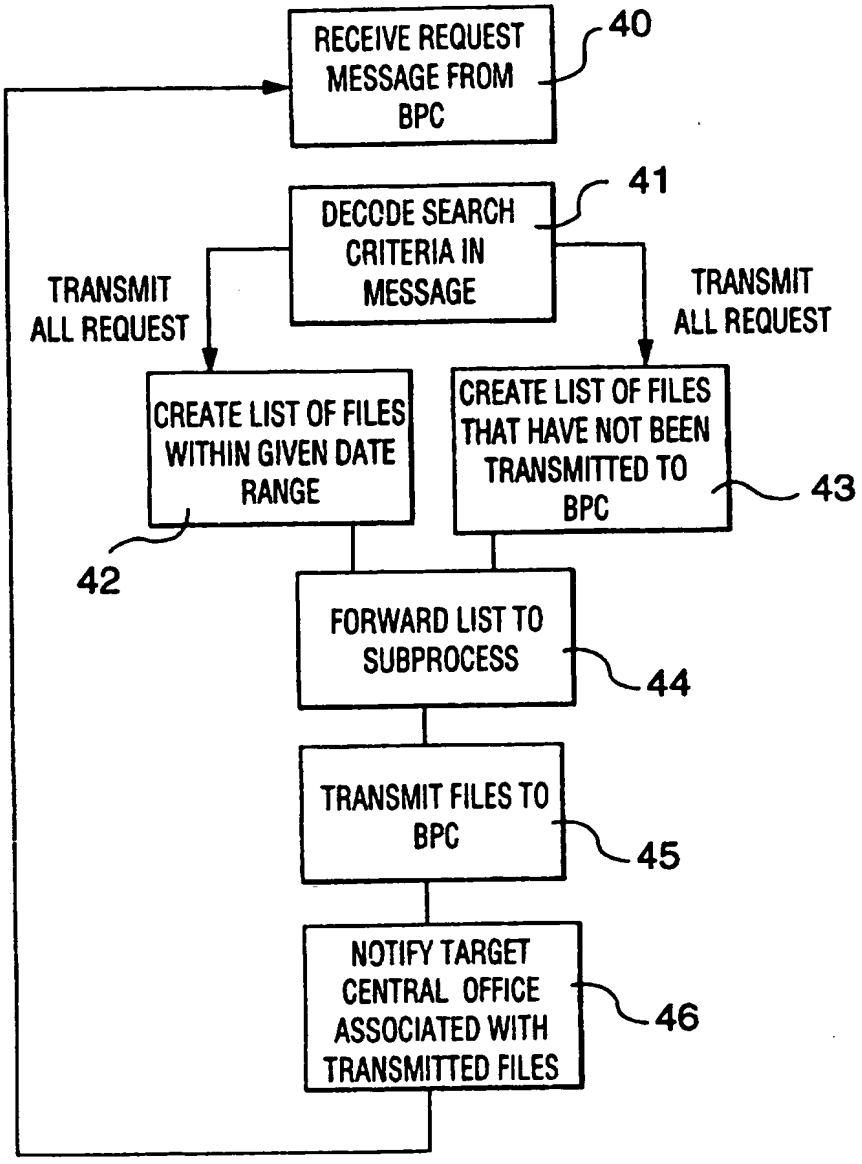
RECEIVE REQUEST MESSAGE FROM BPC
40
DECODE SEARCH CRITERIA IN MESSAGE
41
TRANSMIT ALL REQUEST
TRANSMIT ALL REQUEST
CREATE LIST OF FILES WITHIN GIVEN DATE RANGE
42
CREATE LIST OF FILES THAT HAVE NOT BEEN TRANSMITTED TO BPC
43
FORWARD LIST TO SUBPROCESS
44
TRANSMIT FILES TO BPC
45
NOTIFY TARGET CENTRAL OFFICE ASSOCIATED WITH TRANSMITTED FILES
46

FIG.3

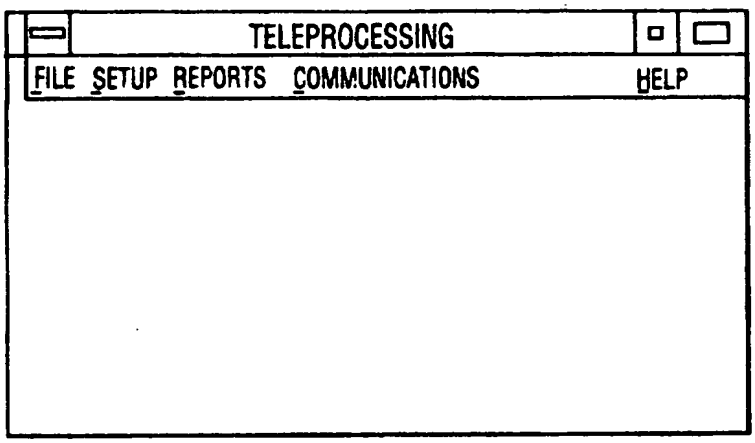

FIG.4

LOW COST TELEPROCESSING SYSTEM

This invention relates to a data processing system, and more particularly to a low cost teleprocessing system for collecting billing data from distributed sources, such as central offices in a telephone network.

Central Office telephone switching systems must keep detailed records of the calls originating and terminating on the switch for billing, administrative and maintenance purposes. These call records are stored on non-volatile local storage media. Because of the large volume of data involved and the complexity of the call records, it is often necessary to transport this data to a batch processing centre, which interprets and acts on (e.g. generates subscriber invoices) this information. The action of collecting, analyzing or transporting this information is known as teleprocessing.

In the past, teleprocessing has been achieved with expensive proprietary hardware embedded into the individual central office systems. Such hardware is complex and expensive.

An object of the invention is to provide a low cost method of automatically collecting billing date from distributed sources.

According to the present invention, there is provided a data processing system for collecting billing data from distributed sources, comprising a plurality of remote customer service sites, each remote site including a memory for storing billing data associated with customer services provided thereby; a central batch processing center for creating customer invoices from billing data associated with all sites; and a teleprocessing center connected to each of

the remote sites and the batch processing center by telecommunications links, the teleprocessing center comprising a communications interface for permitting selective access to memories at the remote sites, a computer for polling each of the remote sites through the communications interface to retrieve selected billing data, a first memory for storing for each remote site an index representing the most recent billing record retrieved from that site, a second memory for simultaneously storing the billing data retrieved from the plurality of remote sites and the computer being programmed to retrieve periodically from the remote sites the most recent billing data as determined by the stored indices, update the stored indices to reflect that most recent retrieved data for each site, and make said data from the second memory available on demand to said batch processing center for processing into customer accounts.

The data processing system can collect and collate call records from a network of central offices without the need for expensive embedded hardware. The batch processing center can be co-located with the data processing system, in which case the computer can provide the data processing functions, or alternatively the batch processing center can be remotely located, in which case the system can forward the collated data to it for convenient processing.

The invention is thus a stand-alone system that can handle the teleprocessing needs of any number of distributed sources, such as central offices.

The retrieval of call records from the target central offices can be fully indexed, and the transportation of the call records to the batch processing system can be done on the basis of date information.

Once the system has been initialized, it can continue to operate without human intervention. To this end, and in a preferred embodiment, the computer is programmed to retrieve the data from the remote sites at predetermined intervals.

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings, in which

Figure 1 is a block diagram of a data processing system in accordance with the invention;

Figure 2 is flow chart showing the operation of the system used to collect call records;

Figure 3 is a flow chart showing the operation of the system used to forward call records to the batch processing center; and

Figure 4 is a diagram of a display screen.

Referring now to Figure 1, a plurality of central offices 1 each comprise a central office switch 2, an associated call record memory 3 and modem 4. The modems 4 are connected to a teleprocessing center 5 over communication lines 6.

The teleprocessing center 5 includes a modem 7, a computer 8, a record retrieval timer 9, a billing data memory 10, and an index memory 11. The modem 7 is also connected over a communications line 12 to a batch processing center 13. Computer 8 is connected to a call record timer 9, display 14, keyboard 17, billing data memory 10, a database comprising index memory 11, data collector 15, and storage manager 16.

During normal operation, the call record processors 3 of central offices 1a, 1b, 1c collect call record data in memory 3a in a conventional manner. The call records are indexed, the index being a number that uniquely identifies each call record to the associated central office.

The call record timer 9 in the teleprocessing center 5 is set to expire at predetermined intervals. When the timer 9 expires, it triggers the computer 8 to retrieve from the index memory 11 the identity of the first target central office it needs to collect data from. The computer 8 then establishes a connection through modems 7 and 4 and retrieves the index from the index memory 11 of the last call record collected from the central office.

The computer 8 then increments this index and places it into a request message that is sent to the target central office 1. This in turn sends the call record corresponding to the index back to the teleprocessing centre 5. The latter examines the date and time of the record and places the record into a physical sequential file on a mass storage medium constituting billing data memory 10. The index is incremented and the process repeated, each new retrieved record being appended to the file in billing data memory 10.

When the target central office has no more records to send, it sends an "end" message to the teleprocessing center 5, which on decoding this message updates the entry and database 14 for the target central office with the index of the last record sent, the date and time period covered by the collected call records, and the names of the physical files created during the call collection process.

Now that the teleprocessing center 5 has finished collecting the records from this target office 1a, it checks the list

of target offices in data base 14 to find the next target office 1b from which to collect records from. Teleprocessing center 5 then initiates collection of these remaining target offices in a similar manner.

The process continues until all the records from all the target central offices have been collected, at which point the teleprocessing center then sets a wake-up timer for the next automatic collection period in the record retrieval timer 9.

The operation of the system can be seen in more detail on referring to the flow chart in Figure 2. Following expiry of the timer in step 20, the identity of the target central office is identified in step 21 and the record index of the last call retrieved in step 22. This index is then incremented in step 23 and a request message formatted and sent to the target central office 1a in step 24.

In step 25, the teleprocessing center 5 waits for a response from the target central office and determines in step 26 whether the response relates to "end record". If no, the record is appended to the end of the physical file in data memory 10 at step 27 and the loop repeated until a "yes" response is obtained, in which case the data base 14 is updated in step 28 and the next target office obtained in step 29.

In step 30, the system determines whether there are any more targets. If not, the wake-up timer is set for the next cycle (step 31) and if there are more targets, the system looks back to step 22.

The automated transfer of the call data to the batch processing center 13 is described with reference to Figure

3. On receipt of a request message from the batch processing center at step 40, the teleprocessing center 5 decodes at step 41 the received message, and according to whether a "transmit date request" or "transmit all request" is received, the center creates a list of files within a given date range (step 42) or creates a list of files that have not been transmitted to the batch processing center (step 43). The names of the physical files which contain the records for the specified dates, stored in billing data memory 10, are located in data base 14. The center 5 then creates a list of these names and then sends this list to a subprocessor within computer 8, which sets up a transmission session with the batch processing center to transmit the files in question (steps 44, 45, and 46).

If a "transmit all" indication is received (step 43), the teleprocessing center 5 creates from the data base 14 a list of files which have not been previously sent to the batch processing center 13 and forwards the list to the sub-processor within computer 8 for transmission. After the sub-processor finishes, the teleprocessing center 5 updates the data base 14 to mark the names of these files as having been "transported". It also retrieves the identity of the target central office which originated the call records in the files and sends each target office an "update message" containing the last index of the transported records.

The data processing system can be regarded as consisting of six modules, namely a human machine interface, which is menu driven, and allows the operator to configure and select the programmable parameters that control the behavior of the teleprocessing system and to initiate the examination/processing/deletion of the call record data files. This is provided by the computer 8, which includes a conventional display and keyboard.

In addition, the system comprises a data collector, which performs the data collection function, obtaining sets of call records from the target central offices, data informer, which on a periodic basis, notifies the target central offices of a successful transferable call record data to the batch processing center, a data viewer, which manages the display of the list of call record files and their contents, and a storage manager, which monitors the consumption of non-volatile storage on a periodic basis and which takes appropriate measures to maintain storage usage at an acceptable level by deleting physical data files that are no longer needed.

A batch processing center interface handles requests from the batch processing center and manages the transfer of call record files to the center.

The teleprocessing system database 11 holds the majority of information needed to drive the system. It contains an organized list of the call record files to be collected from the target offices. Along with unique file identifiers, the data base holds details about the length of each file, the exact origin of each file and the authorization and access codes required to establish connection to the targets.

Two special items are also kept, one indicating which files have been sent to the batch processing center, and the other indicating which files have been sent and for which an acknowledgment has been given to the target central office.

When the center collects the new set of call records from a central office and creates the data file, a new entry describing the file is added to the data base. When the store manager decides to purge a file or when the operator

wishes to delete a file, the corresponding entry must be removed from the data base. The batch processing center interface checks the data base to find out which new files need to be sent to the batch processing center and will update the database 11 once the transfer has been completed.

The data informer will check the data base periodically to find out whether it should notify the target central offices 1 about a successful transfer to the batch processing center. It will update the data base once an acknowledgment has been sent out. Semaphore signalling is used to prevent simultaneous access to the data bases.

While modem communications have been described, the invention is independent of the data collection proceedings used between the teleprocessing center and the target central offices or batch processing center 13. Connections can be made using any number of standard link layer protocols, for example SDLC, LAPB, Bisync.

Because of the modular design and generic platform, the invention can operate on any number of microprocessor platforms. This also implies that the storage capabilities and the speed of operation are completely flexible, which accounts for the system's low cost. Its modularity allows it to run on a simple personal computer.

It will support different call record formats, and has minimal dependency on the format of the call record and can be easily adapted to handle other formats.

Although described in connection with a teleprocessing system, the invention can be applied to any situation involving the collection and collation of data from local or remote sites. It is specifically intended for call record

applications, but can be modified to handle other kinds of information in a straightforward manner.

Figure 4 acts like a standard windows interactive screen. The screen displays progress messages, and allows the operator to enter commands.

Claims

1. A data processing system for collecting billing data from distributed sources, comprising:

a) a plurality of remote customer service sites, each remote site including a memory for storing billing data associated with customer services provided thereby;

b) a central batch processing center for creating customer invoices from said billing data associated with all said sites; and

c) a teleprocessing center connected to each of said remote sites and said batch processing center by telecommunications links, said teleprocessing center comprising:

(i) a communications interface for permitting selective access to said memories at said remote sites;

(ii) a computer for polling each of said remote sites through said communications interface to retrieve selected billing data;

(iii) a first memory for storing for each remote site an index representing the most recent billing record retrieved from that site;

(iv) a second memory for simultaneously storing the billing data retrieved from the plurality of remote sites; and

(v) said computer being programmed to retrieve periodically from said remote sites the most recent billing data as determined by said stored indices, update said stored indices to reflect the most recent retrieved data for each site, and make said data from said second memory available on demand to said batch processing center for processing into customer accounts.

2. A data processing system as claimed in claim 1, wherein said computer is programmed to retrieve said data from said

remote sites at predetermined intervals.

3. A data processing system as claimed in claim 1, wherein said computer is a personal computer.

4. A data processing system as claimed in claim 1, wherein said billing data is telephone billing data and said remote sites comprise central offices.

5. A data processing system as claimed in claim 1, wherein said teleprocessing center includes said central batch processing center, whereby the teleprocessing and batch processing operations are carried out at the same location.

6. A data processing system for collecting billing data from distributed sources, substantially as herein described with reference to the accompanying drawings.

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Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search report)	Application number GB 9521923.4
Relevant Technical Fields (i) UK Cl (Ed.O) G4A (AUXC, AUXF), H4K (KEC, KED) (ii) Int Cl (Ed.6) G06F, H04M	Search Examiner M J DAVIS Date of completion of Search 23 JANUARY 1996
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii)	Documents considered relevant following a search in respect of Claims :- 1-6

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